Energy Policy 123 (2018) 127–135

Contents lists available at ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

Invisible energy policies: A new agenda for energy demand reduction

Sarah Royston[a,*], Jan Selby[a], Elizabeth Shove[b]

[a] University of Sussex, Falmer, Brighton BN1 9RH, UK
[b] Lancaster University, Bailrigg, Lancaster LA1 4YW, UK

ARTICLE INFO

Keywords:
Energy demand
Policy
Governance
Mainstreaming
Integration

ABSTRACT

This article makes the case for a new and ambitious research and governance agenda for energy demand reduction. It argues that existing 'demand-side' approaches focused on promoting technological efficiency and informed individual consumption are unlikely to be adequate to achieving future carbon emissions reduction goals; it points out that very little attention has so far been paid to the impacts of non-energy policies on energy demand; and it submits that a much fuller integration of energy demand questions into policy is required. It advances a general framework, supported by illustrative examples, for understanding the impacts of 'non-energy' policies on energy demand. It reflects on why these connections have been so little explored and addressed within energy research and policy. And it argues that, for all their current 'invisibility', there is nonetheless scope for increasing the visibility of, and in effect 'mainstreaming', energy demand reduction objectives within other policy areas. Researchers and policymakers, we contend, need to develop better understandings of how energy demand might be made governable, and how non-energy policies might be revised, alone and in combination, to help steer long-term changes in energy demand.

1. Introduction

How is energy demand affected … when planners project a 'doubling of flight demand by 2050'(Marsden, 2013), thereby naturalising the need for airport expansion? When energy managers are expected to formulate energy efficiency strategies, but have no role in institutional planning? When free schools are established? When labour markets are liberalised? When development agencies and international organisations subsidise road-building and marginal agriculture? When university promotion committees treat attendance at international conferences as markers of research performance? When hospital trusts are merged and health services centralised? When trade agreements are negotiated? When high-speed broadband is rolled out nationwide? When taxation rates are changed? When pensions are indexed to inflation? When Britain exits from the European Union …

Not much unites this disparate list of policy objectives and processes, but one thing that does is that they all have consequences for energy demand. Some mainly affect the timing of energy demand, some where demand occurs. Some have indirect effects, shaping the many conditions and contexts in which energy-demanding activities happen; others are of direct consequence for specific areas of daily life. Many, but not all, are likely to entail increases in energy consumption. Whichever way, these policies all have wide-ranging, if complex, repercussions for energy demand.

Given this, one might expect such topics to be of central concern to energy research and policy. But they are not. Instead and in general, academic and policy discourse on low-carbon energy transitions focuses on two things: energy supply decarbonisation, including its socio-technical, institutional and geographical dimensions (Cowell, 2017; Lockwood et al., 2017); and increasing the efficiency of energy use (Kern et al., 2017; Mallaburn and Eyre, 2014; Rosenow et al., 2016). The result is something of a divide in research and policy on energy demand. On the one hand, so-called 'demand-side' strategies aspire to reduce consumption through technological efficiency or by persuading individual users to consume less, especially at times of peak demand (through price signals, smart metering, and so on) (Torriti, 2015). However, more fundamental questions about the changing array of 'services' that energy makes possible, about the amount of energy 'needed' in society, or about the role of policy in constituting these 'needs', are not usually asked (Shove and Walker, 2014). And on the other, energy demand reduction is rarely a priority in policy areas like health, welfare or defence, all of which have core priorities of their own. Caught between these dominant approaches, the roles played by 'non-energy policies', as we label them, in sustaining and increasing demand – and the roles they might conceivably play in transforming it – remain largely invisible. Although arguably vital for any effective

* Corresponding author.
E-mail addresses: s.royston@sussex.ac.uk (S. Royston), j.selby@sussex.ac.uk (J. Selby), e.shove@lancaster.ac.uk (E. Shove).

https://doi.org/10.1016/j.enpol.2018.08.052
Received 10 May 2018; Received in revised form 20 August 2018; Accepted 22 August 2018
Available online 28 August 2018
0301-4215/ © 2018 Elsevier Ltd. All rights reserved.

response to climate change, there are no concerted, cross-cutting policy drives to influence long-term patterns of energy consumption or reduce demand as constituted by and through policy.

This paper seeks to identify and theorise this lacuna, and through this to encourage new ways of thinking about how energy demand might be systematically reduced. Our arguments are threefold. The first is that unless one assumes it will be possible to radically reduce carbon emissions and meet all future global energy 'needs', even if these double or triple, then strategies will be required to reduce energy demands – at least in the global North; and that existing approaches to energy demand are unlikely to be adequate. The second is that energy demand – which is an outcome of what people and their machines do in their homes, at work, in leisure time, and in moving around – is powerfully shaped by, among other things, a wide range of policy priorities and processes, some of which are directly to do with energy and its consumption ('energy policies') but most of which are not ('non-energy policies'). Third and following from these two points, we contend that meeting carbon targets depends on extending the remits of 'energy policy' and 'energy research' to include the constitution and transformation of demand by 'non-energy policies'; and on the invention and mainstreaming of demand reduction agendas at multiple policy sites and scales. As outlined below, this calls for a step change in how energy demand is understood and rendered visible, and how policy is mobilised towards this end.

In developing these arguments, we build upon recent research on non-energy policy, plus broad engagement with policymakers, managers and campaigners across a range of sectors, sites and scales. This recent work has included: a scoping review of research on non-energy policy impacts on the energy system (Cox et al., 2016); primary research on energy demand within specific sectors, including higher education, health, and welfare (considered below); and discussions with the UK Department of Business, Energy and Industrial Strategy (BEIS), and with researchers and practitioners working in multiple non-energy areas (DEMAND, 2017). Theoretically, our arguments build principally on social practice theory-informed accounts of energy consumption (Shove and Spurling, 2013; Shove and Walker, 2014), but are also indebted to Foucauldian understandings of governance (Bache and Flinders, 2004; Dean, 2010; Foucault, 1980; Piattoni, 2010) and analyses of the governance dimensions of environmental and energy transitions (Bulkeley et al., 2014; Jordan, 2008; Meadowcroft, 2009). Empirically, most of our examples are from the UK but are relevant to other national or at least high income countries.

Our case unfolds as follows. We begin by justifying the first argument, namely that existing 'demand-side' approaches fail to address the fundamental constitution of energy demand (Section 2), and by showing that, as a corollary, little attention has been paid to the impacts of non-energy policies on energy demand (Section 3). We then move from critique to exposition, advancing an alternative approach which takes fundamental questions of demand and policy to heart. We offer a set of propositions with examples to show how non-energy policy objectives (Section 4) and non-energy policy processes (Section 5) influence energy demand, and review some reasons why these have been so invisible within research and policy (Section 6). We argue that at least some of these barriers are surmountable, and, via an analysis of precedents from other policy fields, suggest that there is scope for mainstreaming and increasing the visibility of energy demand concerns within other policy areas (Section 7). We conclude by calling for researchers and policymakers to develop better understandings of how energy demand might be made governable, and how non-energy policies might be revised to help steer long-term changes in energy demand.

First, several words on terminology and the scope of our argument. In what follows we describe all policy objectives and processes which are not explicitly formulated with energy demand in mind as 'non-energy policies'. By contrast, we use the word 'invisible' to refer to non-energy policies which have unacknowledged, or insufficiently acknowledged, impacts on energy demand. We deploy these phrases whilst simultaneously being aware that they are binary in framing, and recognising that, in actuality, the boundaries between the 'visible' and 'invisible', and between 'energy' and 'non-energy', are always complicated and blurred. 'Visibility' is always a matter of degree and relative (a local energy manager will likely be more aware than her superiors of the potential repercussions of a new institutional strategy for energy demand); moreover, the notion of 'invisibility' does not capture all of the reasons why energy demand receives little attention within non-energy policymaking, as discussed in Section 6. As for 'non-energy policies', we acknowledge that this is a residual and historically contingent category, referring to policies which are not currently – or not yet – generally considered under the rubric of 'energy policy'. Indeed, we view the energy policy / non-energy policy binary as a function of the low visibility of, and low status accorded to, energy demand concerns across most policy worlds. In this sense, invisibility is not merely a characteristic of some non-energy policies, but is their defining and constitutive feature.

Last, a few words on what we do not argue. There is increasing interest in the energy embodied in goods and services, and some think of this energy and its environmental impacts as 'invisible' (Friedemann, 2016; Shui and Harriss, 2006). But this is not how we use the term: our concern is not with the general invisibility of energy, or specific types of energy, but with the invisibility of energy demand within policy, and the invisible effects of policies on energy demand. We also do not explore non-energy impacts of energy policy, for example public health benefits of vehicle emissions regulations or better-insulated homes (Mills and Rosenfeld, 1996). While this issue is sometimes overlooked, it is not nearly as under-researched as the role of non-energy policy in constituting demand (Cox et al., 2016).

2. Beyond efficiency and choice

It is widely accepted that soaring energy demand is a problem, and that reductions in it are vital, if dangerous climate change is to be averted. 'Soaring demand' is identified even by mainstream liberal outlets such as The Economist (2018) as a key factor in the slow implementation of the Paris accords. In parallel, demand reduction is central to many national carbon plans. The UK Government's Carbon Plan explicitly states that '[r]educing our demand for energy is the cheapest way of cutting emissions, and will also benefit consumers and our economy' (HM Government, 2011: 36). Such statements have informed ambitious demand reduction targets: Germany's 2050 Energiewende objective, for instance, is to reduce primary energy consumption by 50% on 2008 levels (Bundesministerium für Umwelt Naturschutz Bau und Reaktorsicherheit, 2013). In practice such goals have translated into two main types of strategy: regulation to increase the energy efficiency of buildings, vehicles and technologies; and the adoption of 'behaviour change' initiatives to 'nudge' people to make better use of energy, whether through carbon and energy taxes, or through the provision of fine-grained energy consumption data (Department for Business Energy and Industrial Strategy, 2018a).

The problem is that despite being positioned as 'demand-side' responses, such approaches take existing interpretations of energy need for granted. More efficient cars and household appliances are expected to deliver the same level of service as the less efficient models they replace, and efficiency programmes consequently reproduce rather than challenge ideas about the functions and needs these goods are expected to meet (Shove, 2017a). Behaviour change initiatives such as the UK's smart metering programme focus on informing individual consumer choice, and thus overlook the institutionalised dynamics of energy-demanding practices. Likewise, while carbon and energy taxes are designed to reduce demand, and while they have a role to play in modifying responses and perhaps adjusting priorities, there are limits to how much they might do so given the classically 'inelastic' character of energy demand (Salari and Javid, 2016; Belke et al., 2011). Such

approaches do not address the historical and socio-technical constitution of consumption patterns (Shove, 2010), exemplified by trends like the rise in average indoor temperatures – in the UK, average indoor temperature increased from 13 °C in the 1970s to 17.7 °C in 2011 (Palmer and Cooper, 2013) – and the more recent proliferation of internet-dependent devices (Pothitou et al., 2017). In the short term, and all other things being equal, information initiatives, taxes, and in particular more efficient appliances, vehicles and buildings can result in less energy being consumed than would have otherwise been the case. But such approaches do not fundamentally challenge existing landscapes of collective convention, and so are unlikely to radically reconfigure the ways in which energy demands are enmeshed in the social, institutional and material fabric of society.

There are other factors involved, but despite extensive investment in efficiency, there are few signs that 'demand' in this more fundamental sense is being scaled back. Global energy consumption continues to rise. The carbon footprints of developed economies continue likewise: the UK's consumption-based emissions rose at a rate of over 1% per annum between 1990 and 2008, before falling slightly during the subsequent recession (Barrett et al., 2013). And despite de-industrialisation, internal energy demand in many developed economies is doing the same: final energy consumption in the UK increased by 0.9% in 2016 on 2015 (Department for Business, Energy and Industrial Strategy, 2017). (Admittedly, this is not a universal pattern: German primary energy consumption fell 9% between 2008 and 2014, partly thanks to efficiency initiatives and partly due to the displacement of industrial production to China and eastern Europe: Kuzemko et al., 2017: 61).

Specific sectors often tell a similar story: in the UK, transport sector energy consumption and carbon emissions have been at best flat since 2005, and have been growing since 2014 – despite the fact that, since 2000, new cars have become more efficient by 28% (diesel cars) and 32% (petrol cars) (Department for Transport, 2017a: 7). Likewise, energy consumption in the UK's higher education sector has increased by 3% since 2005/06, despite significant investment in new building stock (this partly explains why universities are nowhere close to meeting their commitment to 43% emissions reductions by 2020 compared to 2005: BriteGreen, 2017). There are of course positive stories to tell of the benefits of 'avoided energy' (Gillingham et al., 2006; Rosenow and Galvin, 2013). But energy efficiency and behaviour change strategies alone are unlikely to generate those demand reductions which, by common consent, are required to meet current carbon emissions reduction targets, let alone more ambitious future goals. What is missing, and what is needed, are approaches and strategies for understanding and transforming the social and political organisation of society, and the forms of energy demand that follow.

3. Hidden in plain view

Some such approaches already exist. Sociological and historical analyses of energy demand have repeatedly shown that patterns and dynamics of consumption are shaped by shifting configurations of infrastructures, technologies and collective conventions (Cass, 2017; Shove, 2003; Trentmann and Carlsson-Hyslop, 2017). Moreover, macro-oriented and economically determinist studies have sought to explain patterns of energy demand as necessary and inevitable consequences of urbanisation, trade liberalisation or economic growth (Keho, 2016; Kraft and Kraft, 1978; Shahbaz et al., 2015). However, neither of these approaches provide much guidance on how energy demand might be reduced, and neither have much to say about the energy demand implications of policy. Indeed, analyses of the governance dimensions of low-carbon energy transitions barely discuss demand (e.g. Kuzemko et al., 2016). Although the links between non-energy policies and energy demand are not difficult to grasp – as the examples given at the outset of this paper attest – they are rarely noticed, let alone reflected on or put to work within policy and practice. Like many of the best-kept secrets, they are hidden in plain view (Poe, 1844).

This observation is supported by the aforementioned scoping review of research on the impacts of non-energy policies on energy systems (Cox et al., 2016). Despite identifying 576 academic and grey literature studies addressing the effects of specific non-energy policy sectors (e.g. agriculture, communications, culture) on energy systems, this review found that the vast majority of these studies related to energy supply, not demand; and that those studies that do investigate policy impacts on energy demand focus almost exclusively on the impacts of energy policies (especially policies relating to energy efficiency and behaviour change). When other policy areas (i.e. non-energy policy areas) are discussed, this is typically to provide contextual information, rather than to analyse or reflect on their causal impacts on energy supply or demand. The review found no evidence of cross-sectoral comparative research on non-energy policy impacts on energy demand, nor any systematic attempts to theorise or synthesise findings about them.

Recent work has started addressing at least some of these gaps. Research on the UK has explored how national government policy reforms relating to benefits, welfare and housing provision have had implications for energy demand and energy vulnerabilities (Butler et al., 2017). Work on UK higher education has demonstrated how the introduction of undergraduate fees and ending of student quotas has contributed to the ratcheting up of energy demands (Royston, 2016). In Australia, research has analysed how health authorities' guidance on safety affects parents' use of air conditioning (Nicholls and Strengers, 2018), while work on UK hospitals shows how treatment targets and organisational restructuring have implications for energy demand (Blue, 2017). Yet despite these recent advances, the question of non-energy policy impacts on energy demand is barely visible within contemporary academic and policy debate.

4. Non-energy policy objectives

This begs the question of how non-energy policies shape energy demand, to which we now turn. We begin by considering the impacts of non-energy policy objectives on energy demand, that is, the impacts of the substantive content of policies and the stated, or unstated, aims, intentions and agendas underpinning them. We delay discussion of policy processes – the practices and procedures through which policies are formulated, negotiated, coordinated and pursued – until the next section. While acknowledging that this objectives-processes distinction is somewhat stylised – since all new policy objectives have implications for policy processes, and vice versa, and since some objectives, such as devolution initiatives, are essentially about changing the where and how of policymaking – we wish to make six claims about the impacts of non-energy policy objectives on energy demand.

First, non-energy policy objectives exist across multiple spatial scales. They are formulated not only by nation-states but also, at one end of the scale, by international organisations, multinational corporations and trans-national policy networks, and at the other, by regional and local authorities, and institutions like prisons, schools and hospitals. All such institutions, whether national, trans-national or local, have policies, priorities and agendas which shape energy demand. Moreover, in a world of multi-level governance where power is dispersed, however unevenly, across multiple sites and scales (Foucault, 1980; Bache and Flinders, 2004), all such institutions have some degree of power and autonomy in the steering of demand. Of course, some policies have bigger energy demand implications than others. A nationwide policy to roll out high-speed broadband, or limit out-of-town development, would naturally have more wide-ranging (and complex) consequences than a policy change by an individual hospital or local authority. Equally 'meta-policy objectives' – those which cut across multiple policy sectors, like the valorisation of growth, public sector austerity, or marketisation – inevitably have more far-reaching consequences for energy demand than those that are sector-specific. Such differences are important, and we return to them below. Yet it is clear

that there are very few, if any, non-energy policy objectives which are not in some way relevant to energy demand.

Second, the impacts of non-energy policies on energy demand are mostly indirect, and hence often temporally protracted, slow-burning and delayed. This is not always true: benefit cuts, for example, can have fairly immediate consequences for fuel poverty and energy consumption (Butler et al., 2017). More typically, however, the announcement of new policies or regulations does not immediately shift energy demand; instead this only happens when, where and insofar as these policies and regulations affect infrastructure-building, technological design, conventions of normality, and social practices. Thus national and local land use policy decisions to support the development of out-of-town shopping centres have, once implemented and over a period of time, had significant upward impacts on transport-related energy demand (Banister, 1999). The liberalisation of UK and other labour markets since the 1980s has contributed to increases in commuting distances (Peck, 1996; Ozkul, 2014; Department for Transport, 2017b). And the introduction of student fees and broader marketisation of UK higher education since 2000 has led universities to increase investment in high-energy services and infrastructures, whether this be en-suite student accommodation or 24/7 libraries (Royston, 2016). In each of these examples, policy change is one moment in a long-drawn-out process of transition, with delayed and incremental consequences for energy demand. By the same token, once sedimented into infrastructures and conventions of social practice, policy changes can create path dependencies in energy demand which can be very difficult to reverse.

Third, many – indeed probably most – non-energy policy objectives inadvertently contribute to the progressive ratcheting up of aggregate demand. This is evident in the above examples relating to land use, labour market and higher education policies, but applies to many other areas too: for example, the recent preference within UK health authorities for individual patient rooms in hospitals, informed by concerns about infection and privacy, is expanding needs for high energy-consuming equipment to address patient loneliness and facilitate monitoring now that patients are less easily visible (Bradford, 2015; Department of Health, 2013; Pennington and Isles, 2013; Reid et al., 2015). Growth, commodification and marketisation meta-policies are likewise pushing energy demand ever-upwards, not only through their advocacy of straightforward expansion but also by ratcheting up expectations of service and normality. Policies which make energy efficiency investment more difficult do likewise: housing associations, for example, have been found to be 'much more forward-looking … than speculative house-builders' in building low-cost low-energy housing, and it follows that policies privileging the latter may also be contributing to increasing energy demand (Martiskainen and Kivimaa, 2018).

Yet fourth and conversely, wider policy objectives can also reduce demand. Austerity policies in the EU following the 2007–08 financial crisis were associated with large declines in energy and carbon emissions, while in the US a more Keynesian policy mix had very different economic and in turn energy demand consequences (Bel and Joseph, 2015; Weisbrot, 2014). The London congestion charge scheme, aimed principally at improving air quality and journey times, has reduced traffic flows and the associated fuel demand (Beevers and Carslaw, 2005). China's one-child policy between 1979 and 2016 had huge impacts in repressing population growth and in turn energy demand (Eccleston and March, 2011; Zhuang, 2008). During World War Two, the British government introduced 'double summer time' among a raft of policy measures to reduce domestic energy consumption and maximise wartime energy reserves (this was ended in 1947). In 1974, in response to the OPEC oil crisis, the US introduced a nationwide 55 mile per hour speed limit (repealed in 1995). And in 2005, the Japanese government introduced its Cool Biz initiative, designed to loosen office dress codes and in turn reduce demand for air conditioning (Shove et al., 2012). One might reasonably question whether the latter three initiatives should be considered 'non-energy' policies, given that they were explicitly formulated to reduce energy demand (indeed, they illustrate how historically variable the boundary between 'energy' and 'non-energy' policies can be). Plus one might question whether austerity, war and population control are appropriate instruments for demand reduction (to be clear, we are not advocating them). The point here is simply that wide policy objectives can, at a range of sites and scales, have dramatic downward consequences for demand.

Fifth, non-energy policy objectives can also affect the timing and geography of energy consumption. Trade liberalisation policies facilitating the movement of heavy industrial production to less developed countries have had huge consequences for where energy is consumed (Morgan, 2011). Less obvious, but also important, over the last fifty years peaks in electricity demand and transport have shifted in part because of a range of policies directly and indirectly affecting working practices and patterns of employment (Torriti, 2015, 2017).

Last, it is often combinations of and interactions between diverse non-energy policy objectives which matter most for energy demand. Non-energy policies do not play out in isolation; instead individual sectors and the institutions responsible for governing them are typically sites where multiple policies, priorities and agendas intersect. A combination of social welfare and housing policies underpinned the relatively dense design of UK council housing through most of the twentieth century, with knock-on implications for energy needs (Butler et al., 2017). In the world of commercial offices, design and planning standards combine with property market norms to leave developers with little option but to produce Grade A buildings, which are equipped with full air conditioning whether 'needed' or not (Cass, 2017). In the agricultural sector, a combination of food security and economic development goals has meant that the EU's Common Agricultural Policy has promoted intensive use of land and fertilisers, associated with high energy consumption (Rounsevell and Reay, 2009; Zanten et al., 2014). As these examples indicate, multiple objectives coexist within any sector; whether they are aligned or not, the combination of such goals affects energy demand.

5. Non-energy policy processes

The role of policy *processes* in constituting energy demand in some respects mirrors, and in other respects departs from, the role of policy objectives. First, and reflecting the observations made above, policy processes relevant to energy demand take a range of forms, and exist across any number of sites and scales. Decision-making, legislating, negotiation, coordination, oversight, management, and strategic and operational planning are all involved; so too are the development of protocols, performance indicators, standards and guidelines, all means through which policy priorities are concretised and rendered actionable; and so also are practices of regulation, monitoring, evaluation and enforcement. 'Policy processes', in this broad sense, means much more than 'decision-making processes'; instead it refers to the multi-scalar practices through which rules and priorities are worked out and implemented; through which societies and institutions are 'governed' or 'steered' (Rip, 2006); and through which (mostly) non-energy ambitions are realised. Everything from high-level policy decisions taken in inter-governmental fora, through to planning, standard-setting and implementation as enacted by local managers and 'street level bureaucrats' (Lipsky, 2014) can in this sense be considered elements of the 'policy' or 'governance process'. And as with non-energy policy objectives, it is hard to imagine any of these procedures and organisational arrangements not being relevant to energy demand.

The importance of policy processes and the structures and systems in which they are embedded lies in how they simultaneously reflect and facilitate, if also occasionally challenge, relations and hierarchies between assorted energy and non-energy policy objectives. Within governments and institutions, some priorities are always better resourced than others, with bigger and more secure budgets, and a larger and/or

more senior staff with greater capacity for policy formulation, dissemination and implementation. Certain ambitions and objectives are, as a result, much more visible than others. In turn, 'high profile' priorities and objectives tend to have significant reach into adjacent policy areas, or across all of an institution's workings – witness the typical reach of finance departments and ministries – while others remain bounded, 'siloed' and relatively marginalised. Moreover, while some rival policy priorities are relatively well aligned and coordinated, others are not, in which case contradictory policies and agendas may be pursued simultaneously, even across the same institution. Levels of policy development (Hirsch and Schotts, 2017), policy coordination and integration (Mickwitz et al., 2009; Turnpenny et al., 2008) and policy implementation (Hampton, 2018; Schofield, 2001) vary enormously within and across institutions.

The relevance of this for the 'invisible' constitution of energy demand through non-energy policy processes is evident at local and national scales alike. Within institutional spaces like hospitals or commercial office blocks, energy management – that is, management of the networks, resources and systems which enable these institutions' 'core business' to proceed uninterrupted – is typically the province of energy or facilities managers. Roles are clearly demarcated meaning that people in these positions rarely have the power, knowledge, experience or capacity to intervene in, or provide any input on, 'larger' institutional priorities and the energy demands which follow. Indeed, the primary responsibility of most energy managers is the delivery of a constant supply of energy – not energy demand management or reduction (Goulden and Spence, 2015). Conversely, those responsible for broader non-energy institutional goals typically do not see or consider the consequences of what they do for the longer-term dynamics of energy demand. In UK universities, for instance, there exist clear boundaries between those responsible for improving student experience, maximising grant income, promoting internationalisation, managing libraries, upgrading IT networks and so on, and those whose job is to provide the energy required to deliver these goals. There are few institutional spaces in which they come together (Royston, 2016; Sorrell et al., 2000).

Similar patterns recur in national policymaking. For example, the UK Department for Energy and Climate Change (DECC), which was folded into BEIS in 2016, was the smallest department in government and, as an official internal report concluded, did 'not have the capacity to deliver its portfolio' (Kuzemko, 2016: 117). Moreover, DECC and now BEIS, while responsible for the government's smart meter programme and other energy efficiency initiatives, has no programmes or powers to affect, or even evaluate the energy demand consequences of, non-energy policies. There are also few institutional incentives for policy coordination across the energy-non-energy divide. Although some non-energy government departments in the UK do have officials responsible for energy-related issues (the Department for Work and Pensions on fuel poverty; the Department for Communities and Local Government on energy efficiency in housing), it is not their job to shape or even consider the long term uses to which energy is put. Indeed, if anything, under the combined pressures of public sector austerity cuts and Brexit, the siloing of energy demand is growing ever-more pronounced within Whitehall.

Admittedly, equivalent divisions are not reproduced across all sectors and scales. City and local governments have sometimes been arranged in ways which simultaneously reveal and enable systemic approaches to energy and transport demand management at an urban scale, as for instance when spatial planning policies and regulations are deployed to maximise public transport use, minimise green-field development, or deliberately co-locate homes and work places (Brown, 2017; Grazi and van den Bergh, 2008). In California, climate change and affordable housing concerns are currently sparking growing debate about land use zoning codes, which if changed could encourage denser residential development, more building around transport hubs, and reduced commuting distances (Plumer, 2018). More broadly, devolution reforms are explicitly designed to 'shake up' the ways in which policy processes, remits and responsibilities are divided and combined (Heley, 2013; Lyall, 2007). There is no general rule, but in transforming organisational structures and responsibilities such initiatives often involve subtle yet significant shifts in how non-energy policy 'problems' are defined and addressed, with knock-on implications for energy demand.

6. Accounting for invisibility

Before reflecting further on the scope for deliberately and actively mobilising non-energy policy processes and objectives as instruments of demand reduction, we need to consider why such strategies are not currently – or not yet – a normal feature of research and policy. Why are these possibilities and opportunities so invisible?

One factor is that current disciplinary specialisms and theoretical frameworks are not conducive to the systematic, cross-cutting analysis of energy demand at a societal scale. Energy efficiency research focuses on the performance of specific objects, whether boilers or buildings, and thus does not ask broader questions about, say, the 'efficiency' of trade agreements or planning policies. Moreover, energy policy research is, as discussed above, dominated by supply-side concerns (Kanellakis et al., 2013). In part this narrowness reflects a tendency, especially evident in physics and in economics, to conceptualise energy as a quantifiable resource, the consumption of which is taken to indicate 'demand' (Shove, 2017b). Such approaches suppose that people need energy, that such needs should be met, and that these needs and demands are independent of mediating infrastructures, technologies, practices or policies.

Social scientists who have engaged with questions of demand as an outcome of social practice have not been particularly attentive to non-energy policy impacts either. Although theories of social practice have inspired compelling accounts of energy consumption, these rarely make reference to policy of any sort (Warde, 2005). Equally, work in the fields of political economy and political ecology includes much on how global and local energy and environmental crises are shaped by political forces (Swyngedouw et al., 2002) – but these traditions' generally structuralist orientations and their principal interests in capitalism, power and the state mean that they are not particularly concerned with policy per se (Walker, 2007). As for political scientists, while the analysis of policies and their causes and effects is one of their fortes, research on functional policy areas (agricultural policy, welfare policy, etc.) is not: hence one finds scant political science-led work on policy processes relating to energy demand (Kuzemko et al., 2017 is an exception), and even less on non-energy policy impacts specifically. There are thus no established traditions or methods for investigating precisely how non-energy policies shape energy demand.

In addition to these disciplinary and intellectual factors, there are important practical reasons why the effects of non-energy policy on energy demand are so invisible. One is that the problem of 'non-energy policy' is so enormous and so complex that it is difficult to know where to begin, or how to proceed. Put simply, installing more energy efficient light bulbs is far easier than engaging in whole-of-institution and inevitably political conversations about social and organisational priorities. There are no ready-made guidelines to inform planning and decision-making about how much an organisation's energy demand should grow, which non-energy activities should be monitored and regulated for their demand implications, or what performance indicators should be used to evaluate non-energy policy contributions to the shaping of practices and services that demand more energy. Stated differently, most policymakers and organisations, at national and local levels alike, have not yet rethought their institutional goals or processes in light of the challenge of climate change: the typical response has instead been to set ambitious carbon reduction targets without modifying other commitments, including commitments to institutional growth. The consequence is that even when researchers, practitioners

and policy makers recognise that non-energy policies matter for the constitution of energy demand, they know very little about precisely how, or about what could or should be done in response.

The questions of complexity and uncertainty aside, various interests and pressures also militate against broader engagement with questions of energy demand or of how and for what purposes energy is used. Government and social institutions all have mandates centring on core challenges – of saving lives in the case of health services, of educating people in the case of schools, of enhancing mobility in the case of transport departments – and energy issues rightly play at most second fiddle to these. Growth agendas, underpinned by assorted economic and political interests, are reproduced across countless sectors and institutions, and are arguably contrary to radical demand reduction. In addition, the deliberate use of policy tools to reconfigure social practices – which is what using non-energy policies to affect energy demand would amount to – is often framed, at least in neo-liberal societies, as illegitimate social engineering. Not least, energy does not and cannot speak for itself: no 'parliament of things' (Latour, 1993) has been established to give non-human actors a voice amidst the cacophony of human demands, and even it were, energy would not necessarily receive a seat. When vital national interests are threatened, energy demand concerns can attain newfound if temporary prominence, as the above examples from World War Two and the 1970s oil crisis suggest. Yet outside such emergency periods, there has been only the most limited interest from governments and institutions in radical demand reduction. Given the pressures and priorities just outlined, this is hardly surprising.

7. Inventing and mainstreaming an energy demand reduction agenda

In light of the above, one might be tempted to conclude that energy demand and the contribution of non-energy policies thereto will necessarily remain largely invisible. But we wish to resist this conclusion.

One reason for doing so is that there are relevant precedents in other areas of policy and practice. Not so long ago, one might have said that equality and diversity objectives, for example, were relatively marginal next to the core priorities of most institutions, just as energy demand is today. Yet equality and diversity goals have to a significant, if uneven, degree been 'mainstreamed' within and across institutional practices (Moser and Moser, 2005). Many battles remain: we in no way wish to suggest that this mainstreaming has been uniformly successful, or that there is no more to be done (Rees, 2005). Yet hardly anyone would now claim that universities, hospitals, businesses or indeed governments should ignore equalities objectives because their core institutional goals – of teaching and research, saving lives, maximising shareholder value, and legislating – require it. Given that it has proven possible to mainstream equality and diversity priorities without 'core business' falling apart, could energy demand reduction not be mainstreamed within policy and practice too?

Consideration of other domains also sheds light on how this mainstreaming might occur. Most modern policy agendas are primarily pursued within specific institutional sites and spaces – the prison, the school, the hospital and so on – as explored most notably by Foucault (1979, 2003). But in addition, these agendas attain much of their reach and influence by simultaneously being dispersed, disseminated and pursued far more widely. The recognition, for example, that non-health policies and practices, existing across society, affect patterns of well-being and disease has in turn resulted in actions to optimise the health of bodies and populations not only in clinics and hospitals, but also to support the physical safety of people at work ('health and safety policies'), to support people with physical and mental impairments ('occupational health policies'), to regulate food standards, and so on. Equally, while the ideal of ensuring public order takes concentrated form in courts and prisons, it also involves countless actions elsewhere: acts of surveillance, data gathering, education, and so forth (Rose, 2000). Contemporary UK security policy brings the goal of counter-radicalisation not just into hospitals, prisons, universities, but also schools and nurseries (Department of Education, 2015). Moreover, any equalities policy worth its name has to run right through an institution's practices, from hiring and firing, to workload management and pay, to the design and operation of buildings. These examples tells us several things. They suggest, first, that modern societies and institutions are suffused with and part-constituted by multiple governance agendas, and that questions of whether and how these different agendas fit together and become aligned with core institutional priorities are not new.

'Mainstreaming' in the broadest sense is not unusual, indeed quite the opposite. They suggest, second, that such cross-cutting governance agendas are typically rooted in a combination both of centralised legislation and judicial enforcement, as well as of the development of new cultures of best practice, and of local procedures, which often go well beyond the minimum standards dictated by law. And they suggest, third, that the emergence and development of new governance agendas is simultaneously an epistemological and a political process – involving new problem definitions, new ways of making these 'problematisations' visible, as well as new alliances, all at multiple locations and scales. Viewed thus, the development and mainstreaming of an energy demand reduction agenda is not impossible, but would require three forms of change.

One would be much clearer governmental direction relating to carbon emissions. At present, at least within the UK, some specific sectors (e.g. UK central government; NHS England; Higher Education in England) and local institutions (e.g. local authorities; hospital Trusts; universities) have set carbon emissions reduction targets, aiming to contribute towards meeting the national targets within the 2008 Climate Change Act (Sustainable Development Unit, 2014; Department for Environment, Food and Rural Affairs and Cabinet Office, 2016; Higher Education Funding Council for England, 2014). However, these targets are typically voluntary or lack meaningful enforcement, and often exclude some or all 'scope 3′ emissions (indirect emissions from transport, procurement and so on) - a pattern continued by the new voluntary Emissions Reduction Pledge for the public sector launched by BEIS in 2018 (Department for Business Energy and Industrial Strategy, 2018b). In many cases, existing targets have led only to limited local action (success in reducing emissions has often occurred primarily because of decarbonisation of the power grid, rather than because of local action by sectors or institutions themselves) (Committee on Climate Change, 2017). Mandatory emissions reduction targets, including for indirect emissions, combined with some level of external monitoring and enforcement, would compel sectors and institutions to more fully integrate considerations of energy demand (and not just efficiency improvements) into their planning and priorities. This would not require judicial enforcement of energy demand levels per se, which would surely not be appropriate. The suggestion, rather, is that binding carbon emissions reduction targets would – if set such that they could not be met by relying on grid decarbonisation alone – transform the local discussions and practices of non-energy sectors and institutions, including by compelling them to consider a wider range of demand reduction strategies much more seriously than they have done thus far.

A second change required would be epistemological innovation: the invention of new ways of revealing, detailing and quantifying how existing non-energy policy objectives influence, both alone and in combination, the trajectories of energy-intensive social practices and in turn patterns of energy demand; ways of distinguishing which connections are more and which are less important, and which more or less tractable; ways of deciding which policies and practices should be changed; and ways of monitoring, appraising and auditing the impacts of demand reduction initiatives. Such innovations would necessarily borrow widely from existing knowledge and governance apparatuses: from the networks of energy meters now found across most institutions (but typically used just to monitor building energy efficiency); from readily available data on things like transport patterns; and from

concepts and practices used in cognate fields. There is scope, for example, to adapt a concept like 'obesogenic environments' – i.e. environments which contribute to obesity – for demand reduction purposes, and to imagine and design spaces which minimise the 'need' for energy (Kirk et al., 2010). Likewise, there is potential to borrow from the transport sector and transport studies, where it is already widely recognised that transport demand is hugely affected by 'non-transport' policies, whether economic policy, urban planning, or policies regarding education, leisure, or employment (Brown, 2017; Hallsworth et al., 1998; Santos et al., 2010). In both cases, the full significance of these insights has yet to be embedded across relevant areas of research and policy, but there is at least some sense of the significance and the extent of this challenge, and of the related point that consumers' 'needs' have histories and futures that are not fixed, not natural, and not inevitable either.

Ambitious targets and energy efficiency programmes aside, governments and institutions do not currently possess much by way of energy demand reduction policies. It is only through establishing new methods of conceptualising, categorising and measuring demand, as a basis for new forms of governance and intervention, that this might come about.

Third, some reconfiguration of boundaries between 'energy demand' and 'non-energy' issues and the people responsible for, and interested in, them would be required. The invisibility of questions of energy demand is in part sustained and reproduced through organisational and epistemic structures and processes – multiple forms of 'boundary work' (Star, 2010) – which prevent joined-up thinking and governance. It would be a mistake to overstate the importance of this: 'joined-up policymaking' (Ling, 2002) and 'environmental' or 'climate policy integration' (Adelle and Russel, 2013; Jordan and Lenschow, 2010; Lafferty and Hovden, 2003) alone could not increase the visibility of energy demand in the absence of the knowledge and representational innovations discussed above; energy managers are not all clamouring at the door of non-energy policy strategy meetings, full of ideas about how institutional practices could be changed, yet prevented from exercising their voice. In the first instance, before any reconfiguring or 'joining-up' of policy areas, the roles and remits of energy managers would need extending to include responsibility for demand reduction in the fullest sense, rather than just buildings' efficiency and periodic awareness-raising campaigns. Nonetheless, without some relaxation of existing boundaries and divisions it is unlikely that these extended cross-institutional energy demand reduction remits could be fulfilled. In particular, non-energy departments and policy domains are unlikely to think seriously about energy demand reduction, or even carbon, unless energy demand questions – the personnel responsible for them, and their analyses of problems and policy options – are somehow allowed into non-energy planning and policy processes.

Such mainstreaming might take any number of forms, some more radical than others. It certainly would not mean the ditching of core institutional objectives: in no way are we advocating the prioritisation of energy demand reduction over the core educational, health or other goals discussed above, just as equality and diversity campaigners do not advocate this either. Yet the mainstreaming of energy demand reduction would imply some changes in how core objectives are pursued and delivered. Within the higher education sector, for example, mandatory emissions targets combined with the sort of epistemological innovations and boundary changes outlined above might result in initiatives such as the revision of academic promotion criteria, to reduce pressures and expectations around international conference attendance; changes to the structure of the academic year, to limit international student travel; the development of new, locally agreed heating and cooling standards; new guidelines aimed at increasing local procurement; or it may lead, more radically, to decisions not to pursue further institutional growth. Whichever way, such actions would necessitate and spur local conversations, and the development of new planning and decision-making processes, relating to carbon emissions and energy demand. And this in itself would constitute an advance on the status quo.

8. Conclusion

This article has sought to map the contours of a new agenda for energy demand reduction, focused on the role of policy in the constitution of energy demand, and its potential role in transforming it. We have argued that existing 'demand-side' approaches focused on promoting technological efficiency and informed consumer choice are unlikely to be adequate to achieving future (or even current) carbon emissions reduction goals; that 'non-energy' policy objectives and processes have significant though as yet largely ignored and invisible impacts on demand; and, by analogy with other prominent institutional change agendas, that it may be possible to increase the visibility of energy demand within governance and institutional processes, and in effect 'mainstream' energy demand reduction objectives into other policy areas. Doing this, we suggest, presents a simultaneously epistemological and political challenge, requiring work by both researchers and practitioners in making the role of policy in the shaping of energy demand much more visible.

Is it at all conceivable that such a mainstreaming of energy demand objectives could occur? We ourselves are only half persuaded. There are clearly significant obstacles, not least the many other demands on policy, the fact that energy cannot represent itself, plus industrial modernity's apparently inescapable dependence on high levels of energy consumption. Perhaps these and other obstacles mean that the agenda proposed here is in vain. But if so, the implication would be that neither more efficient technologies, nor more energy-sensitive consumer behaviour, nor even energy-sensitive policies will be able to tame energy demand – and that energy demand will continue to grow as the planet warms. If for this reason alone, the potential for mainstreaming energy demand objectives into non-energy policy areas and processes is surely worth exploring further.

Acknowledgements and funding

This work was supported by the DEMAND: Dynamics of Energy, Mobility and Demand Research Centre funded by the Engineering and Physical Sciences Research Council [grant number EP/K011723/1] as part of the Research Councils UK Energy Programme and by EDF as part of the R&D ECLEER Programme.

We are grateful to two anonymous reviewers for their comments.

Disclosure statement

No conflicting interests

References

Adelle, C., Russel, D., 2013. Climate PolicyIntegration: a case of Déjà Vu? Environ. Policy Gov. 23 (1), 1–12.

Bache, I., Flinders, M., 2004. Multi-level governance and the study of the British state. Public Policy Adm. 19 (1), 31–51.

Banister, D., 1999. Planning more to travel less: land use and transport. Town Plan. Rev. 70 (3), 313–338.

Barrett, J., Peters, G., Wiedmann, T., et al., 2013. Consumption-based GHG emission accounting: a UK case study. Clim. Policy 13 (4), 451–470.

Beevers, S.D., Carslaw, D.C., 2005. The impact of congestion charging on vehicle emissions in London. Atmos. Environ. 39 (1), 1–5.

Bel, G., Joseph, S., 2015. Emission abatement: untangling the impacts of the EU ETS and the economic crisis. Energy Econ. 49, 531–539.

Belke, A., Dobnik, F., Dreger, C., 2011. Energy consumption and economic growth: new insights into the cointegration relationship. Energy Econ. 33 (5), 782–789.

Blue, S., 2017. Reducing demand for energy in hospitals: opportunities for and limits to temporal coordination. In: Hui, A., Day, R., Walker, G. (Eds.), Demanding Energy: Space Time and Change. Palgrave Macmillan, New York, pp. 313–338.

Bradford E., 2015. Single hospital rooms - a good idea?. BBC News, 24 August. Available at: 〈www.bbc.co.uk/news/uk-scotland-34043427〉 (Accessed 14 January 2018).

BriteGreen, 2017. University of **** 2020 Carbon Target: Progress Report for the Academic Year 2015/16. Report, September. London: BriteGreen.

Brown D., 2017. The enormous potential of cities to reduce GHG emissions: 571 strategies

adopted by 44 cities around the world. Available at: ⟨www.ethicsandclimate.org/2017/09/01/the-enormous-potential-of-local-governments-to-reduce-ghg-emissions-a-paper-that-identifies-571-strategies-adopted-by-44-cities-around-the-world⟩. (Accessed 15 February 2018).
Bulkeley, H., Andonova, L.B., Betsill, M.M., et al., 2014. Transnational Climate Change Governance. Cambridge University Press, Cambridge.
Bundesministerium für Umwelt Naturschutz Bau und Reaktorsicherheit (2013). What does "energy efficiency" mean? Available at: ⟨www.bmub.bund.de/en/topics/climate-energy/energy-efficiency/what-does-energy-efficiency-mean/?cHash=708635c8a9f766bc5d0c165b53867c44⟩(Accessed 16 February 2018).
Butler, C., Parkhill, K.A., Luzecka, P., 2017. Rethinking energy demand governance: exploring impact beyond 'energy' policy. Energy Res. Soc. Sci. 36, 70–78.
Cass, N., 2017. Energy-related standards and UK speculative office development (Epub ahead of print 14 July 2017). Build. Res. Inf. https://doi.org/10.1080/09613218.2017.1333351.
Committee on Climate Change, 2017. Meeting Carbon Budgets: Closing the Policy Gap: 2017 Report to Parliament. Committee on Climate Change, London.
Cowell, R., 2017. Decentralising energy governance? Wales devolution and the politics of energy infrastructure decision-making. Environ. Plan. C Polit. Space 35 (7), 1242–1263.
Cox, E., Royston, S., Selby, J., 2016. The Impacts of Non-energy Policies on Energy Systems: A Scoping Paper. UKERC, London.
Dean, M.M., 2010. Governmentality: Power and Rule in Modern Society. Sage, London.
DEMAND, 2017. Invisible energy policy: report from one-day conference at UK department of business energy and industrial strategy 20 September 2017. Report, September. Lancaster: DEMAND.
Department for Business, Energy and Industrial Strategy, 2017. Energy Consumption in the UK 2017. Department for Business, Energy and Industrial Strategy, London.
Department for Business Energy and Industrial Strategy, 2018a. Smart meters: a guide. Available at: ⟨www.gov.uk/guidance/smart-meters-how-they-work⟩ (Accessed 15 February 2018).
Department for Business Energy and Industrial Strategy, 2018b. Emissions Reduction Pledge 2020: Guidance for Emissions Reporting in the Public and Higher Education Sectors in England 2018-2020. Department for Business Energy and Industrial Strategy, London.
Department for Environment, Food & Rural Affairs and Cabinet Office, 2016. Greening Government Commitments: Overview of Reporting Requirements 2016–2020. Department for Environment, Food & Rural Affairs and Cabinet Office, London.
Department for Transport, 2017a. Transport Statistics Great Britain 2017. Department for Transport, London.
Department for Transport, 2017b. Commuting Trends in England 1988 - 2015. Department for Transport, London.
Department of Education, 2015. The Prevent Duty - Departmental Advice for Schools and Childcare Providers. Department of Education, London.
Department of Health, 2013. Adult in-Patient Facilities: Planning and Design. Department of Health, London.
Eccleston, C.H., March, F., 2011. Global Environmental Policy: Concepts, Principles and Practice. CRC Press, Boca Raton.
Foucault, M., 1979. Discipline and Punish: The Birth of the Prison. Vintage, Oxford.
Foucault, M., 1980. Power/Knowledge: selected Interviews and Other Writings 1972–1977. Pantheon Books, New York.
Foucault, M., 2003. The Birth of the Clinic: An Archaeology of Medical Perception. Routledge Classics, London.
Friedemann, A.J., 2016. When Trucks Stop Running: Energy and the Future of Transportation. Springer, New York.
Gillingham, K., Newell, R., Palmer, K., 2006. Energy Efficiency Policies: A Retrospective Examination. Annu. Rev. Environ. Resour. 31 (1), 161–192.
Goulden, M., Spence, A., 2015. Caught in the middle: the role of the facilities manager in organisational energy use. Energy Policy 85, 280–287.
Grazi, F., van den Bergh, J.C.J.M., 2008. Spatial organization transport and climate change: comparing instruments of spatial planning and policy. Ecol. Econ. 67 (4), 630–639.
Hallsworth, A., Tolley, R., Black, C., 1998. Transport policy-making: the curse of the uncomfortable consequence. J. Transp. Geogr. 6 (2), 159–166.
Hampton, S., 2018. Policy implementation as practice? Using social practice theory to examine multi-level governance efforts to decarbonise transport in the United Kingdom. Energy Res. Social. Sci. 38, 41–52.
Heley, J., 2013. Soft spaces fuzzy boundaries and spatial governance in post-devolution Wales. Int. J. Urban Reg. Res. 37 (4), 1325–1348.
Higher Education Funding Council for England, 2014. Sustainable Development in Higher Education: HEFCE's Role to Date and a Framework for its Future Actions. Higher Education Funding Council for England, Bristol.
Hirsch, A., Schotts, K., 2017. Policy Development Monopolies: Adverse Consequences and Institutional Responses (Working Paper No. 3137, 25 May). Stanford: Stanford Graduate School of Business, Stanford.
HM Government, 2011. The Carbon Plan: Delivering our Low Carbon Future. The Stationery Office, London.
Jordan, A., 2008. The governance of sustainable development: taking stock and looking forwards. Environ. Plan. C Gov. Policy 26 (1), 17–33.
Jordan, A., Lenschow, A., 2010. Environmental policy integration: a state of the art review. Environ. Policy Gov. 20 (3), 147–158.
Kanellakis, M., Martinopoulos, G., Zachariadis, T., 2013. European energy policy - a review. Energy Policy 62 (C), 1020–1030.
Keho, Y., 2016. What drives energy consumption in developing countries? The experience of selected African countries. Energy Policy 91 (C), 233–246.
Kern, F., Kivimaa, P., Martiskainen, M., 2017. Policy packaging or policy patching? The development of complex energy efficiency policy mixes. Energy Res. Social. Sci. 23, 11–25.
Kirk, S.F.L., Penney, T.L., McHugh, T.-L.F., 2010. Characterizing the obesogenic environment: the state of the evidence with directions for future research. Obes. Rev. 11 (2), 109–117.
Kraft, J., Kraft, A., 1978. On the relationship between energy and GNP. J. Energy Dev. 3 (2), 401–403.
Kuzemko, C., 2016. Energy depoliticisation in the UK: destroying political capacity. Br. J. Polit. Int. Relat. 18 (1), 107–124.
Kuzemko, C., Lockwood, M., et al., 2016. Governing for sustainable energy system change: politics contexts and contingency. Energy Res. Social. Sci. 12, 96–105.
Kuzemko, C., Mitchell, C., et al., 2017. Policies politics and demand side innovations: the untold story of Germany's energy transition. Energy Res. Social. Sci. 28, 58–67.
Lafferty, W., Hovden, E., 2003. Environmental policy integration: towards an analytical framework. Environ. Polit. 12 (3), 1–22.
Latour, B., 1993. We Have Never Been Modern. Harvard University Press, Cambridge, MA.
Ling, T., 2002. Delivering joined-up government in the UK: dimensions issues and problems. Public Adm. 80 (4), 615–642.
Lipsky, M., 2014. Street level bureaucracy: an introduction. In: Hill, M. (Ed.), The Policy Process: A Reader. Routledge, New York, pp. 389–392.
Lockwood, M., Kuzemko, C., et al., 2017. Historical institutionalism and the politics of sustainable energy transitions: a research agenda. Environ. Plan. C Polit. Space 35 (2), 312–333.
Lyall, C., 2007. Changing boundaries: the role of policy networks in the multi-level governance of science and innovation in Scotland. Sci. Public Policy 34 (1), 3–14.
Mallaburn, P.S., Eyre, N., 2014. Lessons from energy efficiency policy and programmes in the UK from 1973 to 2013. Energy Effic. 7 (1), 23–41.
Marsden G., 2013. New runways to support leisure even as transport at home is cut. The Conversation, 19 December. Available at: ⟨www.theconversation.com/new-runways-to-support-leisure-even-as-transport-at-home-is-cut-21659⟩ (Accessed 10 February 2018).
Martiskainen, M., Kivimaa, P., 2018. Creating innovative zero carbon homes in the United Kingdom – intermediaries and champions in building projects. Transitions 46, 15–31.
Meadowcroft, J., 2009. What about the politics? Sustainable development transition management and long term energy transitions. Policy Sci. 42 (4), 323.
Mickwitz, P., Aix, F., Beck, S., et al., 2009. Climate Policy Integration Coherence and Governance (PEER Report no. 2). PEER, Helsinki.
Mills, E., Rosenfeld, A., 1996. Consumer non-energy benefits as a motivation for making energy-efficiency improvements. Energy 21 (7), 707–720.
Morgan, N., 2011. Carbon Emission Accounting – Balancing the books for the UK. Energy Insight briefing paper. UKERC, London.
Moser, C., Moser, A., 2005. Gender mainstreaming since Beijing: a review of success and limitations in international institutions. Gend. Dev. 13 (2), 11–22.
Nicholls, L., Strengers, Y., 2018. Heatwaves cooling and young children at home: integrating energy and health objectives. Energy Res. Social. Sci. 39, 1–9.
Ozkul, B.D., 2014. Changing home-to-work travel in England and Wales. Reg. Stud. Reg. Sci. 1 (1), 32–39.
Palmer, J., Cooper, I., 2013. UK Housing Energy Fact File. Department of Energy and Climate Change, London.
Peck, J., 1996. Work-place: The Social Regulation of Labor Markets. Guilford Press, New York.
Pennington, H., Isles, C., 2013. Should hospitals provide all patients with single rooms? BMJ 347 (September), 24. https://doi.org/10.1136/bmj.f5695.
Piattoni, S., 2010. The Theory of Multi-Level Governance: Conceptual Empirical and Normative Challenges. OUP, Oxford.
Plumer B., 2018. Housing battle or climate solution? The New York Times, 18 January. Available at: ⟨www.nytimes.com/2018/01/18/climate/nyt-climate-newsletter.html⟩ (Accessed 13 March 2018).
Poe, E.A., 1844. The purloined letter. In: Carey, E.L., Hart, A. (Eds.), The Gift: A Christmas and New Year's Present for 1845. Carey and Hart, Philadelphia, pp. 41–61.
Pothitou, M., Hanna, R.F., Chalvatzis, K.J., 2017. ICT entertainment appliances' impact on domestic electricity consumption. Renew. Sustain. Energy Rev. 69, 843–853.
Rees, T., 2005. Reflections on the uneven development of gender mainstreaming in Europe. Int. Fem. J. Polit. 7 (4), 555–574.
Reid, J., Wilson, K., Anderson, K.E., Maguire, C.P.J., 2015. Older inpatients' room preference: single versus shared accommodation. Age Ageing 44 (2), 331–333.
Rip, A., 2006. A coevolutionary approach to reflexive governance – and Its Ironies. In: Voss, J.P., Bauknecht, D., Kemp, R. (Eds.), Reflexive Governance for Sustainable Development. Edward Elgar, Cheltenham, pp. 82–100.
Rose, N., 2000. Government and control. Br. J. Criminol. 40 (2), 321–339.
Rosenow, J., Fawcett, T., et al., 2016. Energy efficiency and the policy mix. Build. Res. Inf. 44 (5–6), 562–574.
Rosenow, J., Galvin, R., 2013. Evaluating the evaluations: evidence from energy efficiency programmes in Germany and the UK. Energy Build. 62, 450–458.
Rounsevell, M.D.A., Reay, D.S., 2009. Land use and climate change in the UK. Land Use Policy 26 (Supplement 1), S160–S169.
Royston S., 2016. Invisible energy policy in Higher Education. In: Proceedings of the Demand Conference, Lancaster, UK, 13–15 April, 2016.
Salari, M., Javid, R.J., 2016. Residential energy demand in the United States: analysis using static and dynamic approaches. Energy Policy 98, 637–649.
Santos, G., Behrendt, H., Teytelboym, A., 2010. Part II: policy instruments for sustainable road transport. Res. Transp. Econ. 28 (1), 46–91.
Schofield, J., 2001. Time for a revival? Public policy implementation: a review of the literature and an agenda for future research. Int. J. Manag. Rev. 3 (3), 245–263.
Shahbaz, M., Loganathan, N., et al., 2015. The effect of urbanization affluence and trade

openness on energy consumption: a time series analysis in Malaysia. Renew. Sustain. Energy Rev. 47, 683–693.
Shove, E., 2003. Converging conventions of comfort cleanliness and convenience. J. Consum. Policy 26 (4), 395–418.
Shove, E., 2010. Beyond the ABC: climate change policy and theories of social change. Environ. Plan. A: Econ. Space 42 (6), 1273–1285.
Shove, E., 2017a. Energy and social practice: from abstractions to dynamic processes. In: Labanca, N. (Ed.), Complex Systems and Social Practices in Energy Transitions: Framing the Issue of Energy Sustainability in the Time of Renewables. Springer International Publishing, Cham, pp. 207–220.
Shove, E., 2017b. What is wrong with energy efficiency? (Epub ahead of print 29 August 2017). Build. Res. Inf. https://doi.org/10.1080/09613218.2017.1361746.
Shove, E., Spurling, N. (Eds.), 2013. Sustainable Practices: Social Theory and Climate Change. Routledge, Abingdon.
Shove, E., Walker, G., 2014. What is energy for? Social practice and energy demand. Theory Cult. Soc. 31 (5), 41–58.
Shove, E., Pantzar, M., Watson, M., 2012. The Dynamics of Social Practice: Everyday life and how it changes. Sage, London.
Shui, B., Harriss, R.C., 2006. The role of CO_2 embodiment in US–China trade. Energy Policy 34 (18), 4063–4068.
Sorrell, S., Schleich, J., Scott, S., et al., 2000. Reducing Barriers to Energy Efficiency in Public and Private Organisations. SPRU, Falmer.
Star, S.L., 2010. This is not a boundary object: reflections on the origin of a concept. Sci. Technol. Hum. Values 35 (5), 601–617.
Sustainable Development Unit, 2014. Sustainable, Resilient, Healthy People & Places: a Sustainable Development Strategy for the NHS, Public Health and Social Care System. Sustainable Development Unit, Cambridge.
Swyngedouw, E., Kaïka, M., Castro, E., 2002. Urban water: a political-ecology perspective. Built Environ. 28 (2), 124–137.
The Economist, 2018. The world is losing the war against climate change (2 August).
Torriti, J., 2015. Peak Energy Demand and Demand Side Response. Routledge, London.
Trentmann, F., Carlsson-Hyslop, A., 2017. The evolution of energy demand in Britain: politics, daily life and public housing 1920s–1970s (Epub ahead of print 10 November 2017). Hist. J. https://doi.org/10.1017/S0018246×17000255.
Turnpenny, J., Nilsson, M., Russel, D., et al., 2008. Why is integrating policy assessment so hard? A comparative analysis of the institutional capacities and constraints. J. Environ. Plan. Manag. 51 (6), 759–775.
Walker, P.A., 2007. Political ecology: where is the politics? Progress. Hum. Geogr. 31 (3), 363–369.
Warde, A., 2005. Consumption and theories of practice. J. Consum. Cult. 5 (2), 131–153.
Weisbrot, M., 2014. Why has Europe's Economy Done Worse Than the US? The Guardian, London (Accessed 13 March 2018). ⟨www.theguardian.com/commentisfree/2014/jan/16/why-the-european-economy-is-worse⟩.
Zanten, B.T., van Verburg, P.H., Espinosa, M., et al., 2014. European agricultural landscapes, common agricultural policy and ecosystem services: a review. Agron. Sustain. Dev. 34 (2), 309–325.
Zhuang, G., 2008. How will China move towards becoming a low carbon economy? China World Econ. 16 (3), 93–105.